A Data-Driven Framework for Monitoring and Improving Organ Donation Awareness among Minorities using Optimal Social Network Intervention

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Purpose

Increasing the number of organ donors can greatly enhance organ transplantation, but past health interventions have been ineffective in generating both large-scale and sustainable change, particularly among minorities. We propose to monitor and improve awareness by using a data-driven framework that employs social media to track social markers of awareness and deliver optimized social network interventions (SNI) to targeted audiences.

Methods

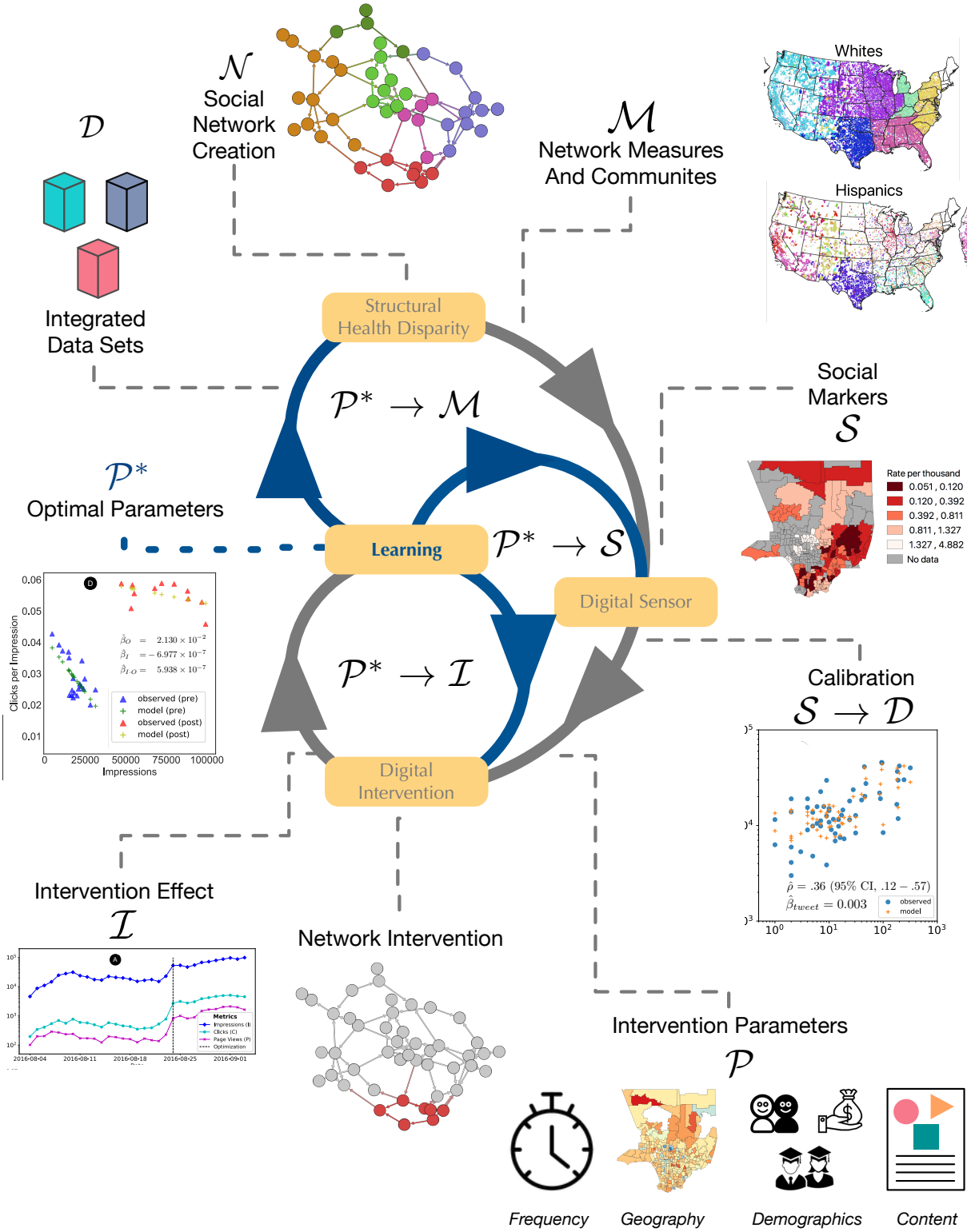
We monitored social markers of awareness across the US over a 1-year period using Twitter and examined their association using real data of organ donor registries. We delivered social network interventions on Facebook with and without optimized awareness content (i.e., educational content with link to online donation registration) to low-income Hispanics in Los Angeles over a 1-month period, and measured daily number of impressions (i.e., exposure) and clicks (i.e., engagement) among the target audience.

Results

Social markers of awareness are associated with donation registration ($r = .36$, $p < .05$), and an additional 10 awareness-related tweets are associated with a 3% increase in the number of organ donor registrations. Additional 21 (95% CI, 8 to 35) clicks can be obtained per thousand of impressions after the optimization, with the number of clicks per thousand impressions increasing from 42 (95% CI, 35 to 48) to 63 (95% CI, 50 to 77).

Conclusion

Our results suggest that our framework can provide a real-time characterization of organ donation awareness and its disparities, while effectively delivering tailored intervention to minority communities. Our framework has the potential to create large-scale, sustainable interventions capable of raising awareness and effectively mitigating disparities in organ donation.


$\mathcal{N}$
Social Network Creation
$\mathcal{M}$
Network Measures And Communites
Whites
Hispanics
$\mathcal{D}$
Integrated Data Sets
Structural Health Disparity
$\mathcal{P}^* \rightarrow \mathcal{M}$
Social Markers
$\mathcal{S}$
Rate per thousand
0.051 , 0.120
0.120 , 0.392
0.392 , 0.811
0.811 , 1.327
1.327 , 4.882
No data
$\mathcal{P}^*$
Optimal Parameters
Learning
$\mathcal{P}^* \rightarrow \mathcal{S}$
Digital Sensor
Clicks per Impression
Impressions
observed (pre)
model (pre)
observed (post)
model (post)
$\mathcal{P}^* \rightarrow \mathcal{I}$
Calibration
$\mathcal{S} \rightarrow \mathcal{D}$
$\hat{\rho} = .36$ (95% CI, .12 – .57)
$\hat{\beta}_{tweet} = 0.003$
observed
model
Digital Intervention
Intervention Effect
$\mathcal{I}$
Network Intervention
Intervention Parameters
$\mathcal{P}$
Frequency
Geography
Demographics
Content